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## STANDARD CARS FOR UNDERGROUND MINING OPERATIONS

V. V. Vladimirov

The three types of mine cars generally used are closed cars, dump cars, and self-unloading cars.

**Closed Cars**

The most widely used are the cars manufactured by the "Kommunist" Kirov Works with a capacity of 0.82 and 1.2 cubic meters. A 0.65 cubic meter car is now being designed. "ShakhtStroy" cars with a capacity of 1, 2 and 3 tons are usually used in coal mines. The closed cars are well built, rugged, and can be operated advantageously under most conditions.

Cars with a capacity of 0.65 and 0.82 cubic meters are recommended for heavy as well as light ores. Cars with 1.2 cubic-meter capacity are not recommended for light ores as the cars' tare coefficient is very high (that is, the ratio  $W_{\text{cart}}/W_{\text{total}}$  is high).

In large mines with cage haulage, the use of cars of 2 cubic-meter capacity is recommended. The cars are dumped into an underground bunker. Cars with a 1.1, 2.2 or 3.3 cubic-meter capacity are used in mines for low-density ores.

## Dump Cars

Best known types are:

YCh - 0.43 cubic meter (new model known as V0-1)  
 VK - 0.45 cubic meter (new model known as V0-2,  
 Capacity 0.5 cubic meter)  
 VZh - 0.81 cubic meter (new model known as V0-3)  
 VI - 0.85 cubic meter  
 VJ - 1 cubic meter (new model known as V0-3, capacity  
 1.2 cubic meters)

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VV -- 1 cubic meter (new model known as VO-5)

Dump cars, which have been in production for some time; include:  
 Kalatinsk type - 0.3 cubic meter (manufactured by Klinitskiy Works No 6)  
 " " - 0.4 cubic meter (manufactured by Klinitskiy Works No 6)  
 " " - 0.75 cubic meter (manufactured by Toretzkiy Works imeni  
 Voroshilov)

VZh type - 0.8 cubic meter (manufactured by Metallo-Konstruktsiya Works,  
 Leningrad)  
 " " - 1 cubic meter (manufactured by Toretzkiy Works imeni Voroshilov)

Cars manufactured at present by the "Kommunist" Works are the same as the old model. However, their construction is weak and their cargo capacity is small.

The VCh car is difficult to standardize as it uses a 500 millimeter track.

The VO-2 has a greater capacity than the VO-1, but it is heavier which makes it operationally disadvantageous. The VO-1 is recommended as the best car, as it has optimum dimensions, weight and tare coefficient. It is possible to use this car for light as well as heavy ores.

The 0.81 cubic-meter-capacity car is preferred over the 0.85 cubic-meter car as it is wider and deeper but shorter than the latter. In addition it has a lower tare coefficient.

For general ore haulage the CO-1 with capacity of 0.43 cubic meters, the VO-5 with 0.81 cubic-meter capacity, and the VO-5 with a 1 cubic-meter capacity are recommended. Sizes and the width of tunnels should be made to accommodate the above mentioned cars.

#### Self-Unloading Cars

Two types are generally used in the USSR: those which have a drop bottom, and those which have hinged sides. The latter is the more popular as it is built better and gives better service. The side-unloading car, with 2.65 cubic-meter capacity, is used at the Kirov apatite mines. There is no data regarding the car with 4.5 cubic-meter capacity. However, it is not being used very much. The great disadvantage of the cars which unload through the side is that they are not made for carrying finely crushed ore or ore having a high water content. It is recommended that all mines using the side-unloading cars change over, as much as possible, to the smaller capacity cars (1.75 and 1.57 cubic-meter capacity). These latter are now being manufactured by the "Kyshtymsk" Works.

#### Conclusions

The 0.65 and 0.82 cubic-meter cars are recommended for low-production mines, which go down to great depths and where the underground (horizontal) haulage is not over long distances. These cars are best used for ores having low density.

The 1, 2 and 3 ton cars are recommended for coal mines.

Dump cars are recommended for supplementary service, particularly for hauling waste from the mine levels to the surface. At times these dump cars can be used advantageously in mines having a complex system of shafts and tunnels, e. g., where there are several loading and unloading points. The use of 0.81 and 1 cubic-meter capacity dump cars is recommended for this type of work.

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The VO-1 car with a 0.45 cubic-meter capacity can be used for both light and heavy ores. It can be used advantageously for hauling ore to the surface in small mines.

The self-unloading car of 2.65 cubic meter capacity is recommended for heavy-production mines. The 1.57 cubic-meter capacity car is recommended for average production mines.

The 2 cubic-meter closed car is advantageous only at heavy production mines.

Table 1. Some Characteristics of Present Day Cars and Methods of Utilizing Them

<u>Productivity of Mine</u>	<u>Physical Properties of Ore and Rock</u>	<u>Haulage From Mine Levels to Surface</u>	<u>Type of Cargo</u>	<u>Type of Car</u>
Low and average	variable	cage	ore and rock	closed car VG-3
High	"	charging skip	"	closed car
Low and average	"	cage	"	dump car VO-1 VO-2 VO-3 VO-5
	dry, lumpy	charging skip	"	self- and unloading
High	"	1. charging skip 2. via tunnels	ore	"
<u>Coal Cars</u>				
Average and high	"	cage charging skip	ore and rock	closed car

Note: Tare coefficient is computed on following data:

1. Full load coefficient is 1.
2. Average weight of 1 cubic meter of dry granulated material for ordinary ore - 1.85 T/m<sup>3</sup>, for ore with low density 1.3 and 1.5 T/m<sup>3</sup>.

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Table 1. (Contd)

<u>Productivity of Mine</u>	<u>Capacity of Cars</u>	<u>Dimensions of Cars mm</u>	<u>Dead Weight kg</u>	<u>Track Gauge mm</u>
Low and average	0.65	1,500 x 840 x 1,000	420	600
	0.82	1,530 x 884 x 1,075	470	600
	1.2	2,087 x 1,180 x 1,186	950	750
High	2	3,290 x 1,250 x 1,200	1,420	750
Low and average	0.43	1,420 x 690 x 1,120	275	600
	0.5	1,800 x 1,164 x 1,000	520	600
	0.81	1,636 x 1,200 x 1,210	750	600
	1.0	2,830 x 1,300 x 1,270	1,300	750
	1.57	3,170 x 1,535 x 1,280	2,041	750
High	2.65	4,700 x 1,550 x 1,480	3,000	750
	4.5	5,015 x 2,000 x 1,900	4,500	750
<u>Coal Cars</u>				
Average and high	1.10	2,400 x 880 x 1,150	595	600
	2.2	3,223 x 1,240 x 1,150	1,120	900
	3.3	3,895 x 1,320 x 1,300	1,560	900

Table 1. (Contd)

<u>Productivity of Mine</u>	<u>Weight of Ore</u>		<u>Tare Coefficient</u>	
	<u>General</u>	<u>With Low Den- sity Ore</u>	<u>General</u>	<u>With Low Den- sity Ore</u>
Low and average	1.2	0.85 - 0.97	0.35	0.5 - 0.44
	1.52	1.07 - 1.23	0.31	0.44 - 0.38
	2.22	1.58 - 1.8	0.42	0.6 - 0.52
High	3.7	2.6 - 3.0	0.38	0.56 - 0.48
Low and average	0.8	0.56 - 0.65	0.34	0.49 - 0.42
	0.93	0.65 - 0.75	0.56	0.8 - 0.74
	1.5	1.05 - 1.22	0.5	0.72 - 0.62
	1.85	1.3 - 1.5	0.7	1.0 - 0.87
	2.9	2.24 - 2.36	0.7	1.0 - 0.87
High	5.0	3.45 - 4.0	0.6	0.87 - 0.75
	8.3	5.85 - 6.75	0.55	0.77 - 0.67
<u>Coal Cars</u>				
Average and high	---	1.43 - 1.65	---	0.43 - 0.36
	---	2.86 - 3.30	---	0.39 - 0.34
	---	4.29 - 4.95	---	0.36 - 0.31

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Table 2. Recommended Types of Cars

Type of Car	Capacity Cu m	Ton	Gauge mm	Dead Weight kg
For ore having a density more than 2.5 T/m <sup>3</sup>				
Closed car	0.65	1.2 - 1.95	600	420
Krivoy Rog	0.82	1.52 - 2.46	600	470
	1.2	2.22 - 3.6	750	950
	2.0	3.7 - 6	750	1,420
Dump car	0.43	0.8 - 1.29	600	275
Krivoy Rog	0.81	1.5 - 2.43	600	750
	1	1.85 - 3	750	1,300
Self-unloading (through side)	1.57	2.9 - 4.71	750	2,041
	2.65	5.0 - 7.95	750	3,000

For ore having a density less than 2.5 T/m<sup>3</sup>

Closed car	0.65	0.85 - 1.2	600	420
Krivoi Rog	0.82	1.07 - 1.52	600	470
Closed car	1.1	1.43 - 2.04	600	595
Shakhtstroy for coal mines	2.2	2.86 - 4.08	900	1,120
	3.3	4.29 - 6.12	900	1,560
Dump car	0.43	0.56 - 0.8	600	275
Krivoi Rog				

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